Environmental Impact Review Board

PUBLIC REVIEW
of the
ESSO CHEVRON et al ISSERK I-15
DRILLING PROGRAM

November 1, 1989

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ENVIRONMENTAL IMPACT REVIEW BOARD

REPORT ON THE

PUBLIC REVIEW of the

ESSO CHEVRON et al ISSERK I-15

DRILLING PROGRAM

1.0 THE PUBLIC REVIEW

1.1 Jurisdiction of the Environmental Impact Review Board

The Inuvialuit Final Agreement (IFA), dated June 5, 1984, settled the land claim of the Inuvialuit in the Western Arctic Region of Canada. This Agreement was "approved, given effect and declared valid" by Section 3(1) of the Western Arctic (Inuvialuit) Claims Settlement Act, being Chapter 24, 32-33, Elizabeth II of the Statutes of Canada.

The Act further provided in Section 3(2) that the beneficiaries under the Agreement "shall have the rights, privileges and benefits set out in the Agreement", and in Section 4 that the provisions of the Act and of the Agreement will prevail over any other law applying to the Territory in the event of inconsistency or conflict.

Being a land claims settlement within the meaning of Section 35 of the Constitution Act, 1982, the Agreement is thereby affirmed as an existing aboriginal right. In consequence of these statutory provisions, the terms of the Agreement are given a preferred status over all other federal and territorial laws within the defined Inuvialuit Settlement Region in the Western Arctic.

This Agreement is the source of the Board's jurisdiction to review the **Esso Chevron et al Isserk I-15 Drilling Program** (Isserk I-15).

1.2 Mandate of the Board

Under the IFA, Isserk I-15 is a "development" within the meaning of Section 2 and, as such, is subject to screening by the Environmental Impact Screening Committee (EISC), pursuant to the provisions of Sections 11 and 13 of the Agreement. Section 11(16) authorizes the EISC to refer the development to the Environmental Impact Review Board (the Board) for a public review and environmental impact assessment if the EISC determines that the development could have significant negative environmental impact, or negative impact on present or future wildlife harvesting [Section 13(8)].

By a letter dated August 30, 1989, from Gary Wagner, Secretary to the EISC, to J. Livingstone, Chairman of the Board, the EISC referred Isserk I-15 to the Environmental Impact Review Board for further environmental impact review and assessment. A supplementary letter from Mr. Wagner to Mr. Livingstone dated September 14, 1989, amplified the reasons of the EISC for making the referral. These reasons included concern regarding the thoroughness of contingency planning, as well as the effectiveness of oil spill countermeasures. In addition, reference was made to a conflict of opinion between the Department of Indian Affairs and Northern Development (DIAND) and the Canada Oil and Gas Lands Administration (COGLA) regarding the effectiveness and applicability of the long-standing policy on "same season relief well capability".

1.3 Procedures of the Board

Pursuant to the powers given to it by Section 11(23) of the IFA to establish and adopt by-laws and rules for its internal management and procedures, the Board has enacted By-Law No. 1 and published its Operating Procedures. These documents, together with the IFA, contain the rules and guidelines that constitute the procedures of the Environmental Impact Review Board. These Operating Procedures call for the appointment by the Chairman of Review Panels to conduct Public Reviews.

These Review Panels are to include the Chairman, two Inuvialuit Game Council appointees to the Board, one Member representing Canada, and one Member representing either the Government of the Northwest Territories (GNWT) or the Government of Yukon (YTG), depending on the location of the development.

1.4 Appointment of the Review Panel

By means of letters dated September 23, 1989, the Chairman appointed the following Board members to comprise the Review Panel for the Public Review of the **Esso Chevron et al Isserk I-15 Drilling Program:**

James I. Livingstone	Chairman
Nelson Green	Inuvialuit Game Council
Ron D. Livingston	GNWT
Ewan Cotterill	Government of Canada
Calvin Pokiak	Inuvialuit Game Council

The Review Panel conducts the Public Review on behalf of the Board.

1.5 Decision Making Powers of the Board

Under Section 11(24) of the IFA, the Board is required, once the Public Review has been conducted, to expeditiously render a Decision as to whether or not, on the basis of the evidence and information before it, the development should proceed.

If the Board decides that the development may proceed, it must make recommendations as to Terms and Conditions that should apply to the development, including mitigative and remedial measures.

The Decision containing the recommendations of the Board must be transmitted to the government authority competent to authorize the development [Section 11(27)]. If provisions for compensation for loss or damage to wildlife or wildlife harvesting activities are deemed necessary, the Board must also provide "worst case" estimates of potential legal liability [Section 13(11)(b)].

If the competent government authority is unwilling or unable to accept the recommendations of the Board, or wishes to modify any of them, reasons must be provided in writing within 30 days of the Decision [Section 11(29)]. The decision of the competent government authority must be sent to all interested parties and be made public.

No licence or approval shall be issued by the competent government authority permitting any proposed development to

proceed unless the provisions of the Environmental Impact Screening and Review Process under the IFA have been complied with [Section 11(31)].

1.6 Initiating the Public Review

In accordance with clause 6(b) of the Operating Procedures, the Board caused a Public Notice dated September 24, 1989, to be published in regional newspapers and broadcast through local radio stations announcing that public meetings would commence in Tuktoyaktuk on October 24, 1989. (A copy of this Public Notice is attached as Appendix A to this Decision).

1.7 Public Meetings

Public meetings were held in Kitti Hall in Tuktoyaktuk on October 24, 25, and 26, 1989. Those organizations and individuals who presented written submissions, and those who appeared at the meetings to present oral submissions, are listed in Appendix C.

Under the Board's Operating Procedures, the purpose of the public meeting is to determine whether the Board can make a Decision to recommend approving or rejecting the development without holding a more formal public hearing. The public meeting procedures are designed to be informal, but sufficiently rigorous, to enable the Board to make a fully-informed Decision in the event that it should decide that a full public hearing is not necessary.

In this case, detailed information concerning the development was obtained from Esso Resources Canada Limited in the form of the document entitled **Esso Chevron et al Isserk I-15: Submission to the Environmental Impact Review Board.** This document contained the Environmental Impact Statement (EIS) required by the Board. Also provided were supplementary filings and written answers to questions that had been addressed in writing to Esso by the Board.

For the purpose of examining the material submitted by Esso, the Board engaged three consultants: Dr. R. Davis to review environmental issues, Mr. W. Scott to examine oil well drilling procedures, and Mr. E. Owens to comment on containment and clean-up of oil spills.

On the first day of the public meetings, all of the prepared materials were presented on behalf of Esso, the Inuvialuit Game

Council/ Inuvialuit Regional Corporation, and the other submitters who are identified in Appendix C.

Government representatives of DIAND, COGLA, the Canadian Coast Guard (CCG), the Department of Environment (DOE), the Department of Fisheries and Oceans (DFO), and the GNWT described the regulatory regimes under which they operate, and provided comments respecting the issues before the Board.

To begin the second day of the public meeting, the Board proposed an agenda of key issues for discussion. These key issues are listed in Appendix F, and they provided the framework for the Board's analysis and Decision related herein. On the second and third days of the public meeting, these issues were carefully tested by a process of direct questioning of the Esso representatives and consultants by the Review Panel, by the Inuvialuit Game Council/ Inuvialuit Regional Corporation, and by the other participants, including the government representatives and the general public.

When this process was completed, the Submitters made final presentations summarizing their recommendations and made suggestions with respect to terms and conditions required should the Board recommend approval of the Isserk I-15 development to the competent government authority. Esso's team responded to these final submissions and provided its own concluding observations.

The proceedings of these public meetings were recorded and transcribed in order to provide a public record. This public record may be examined during normal business hours at the office of the Joint Secretariat, 107 Mackenzie Road, Inuvik, Northwest Territories.

The Board is satisfied that it can recommend approval of the Esso Chevron et al Isserk I-15 Drilling Program, subject to terms and conditions, without holding a full public hearing.

2.0 BOARD'S ANALYSIS AND CONCLUSIONS

2.1 Introduction

The task of the Board is to assess the likely environmental impacts of the Isserk I-15 project and to define mitigative, remedial and compensation measures that should be attached as recommended terms and conditions to any government licence or permit that approves the project.

During the course of the Public Meetings in Tuktoyaktuk, many of these measures were identified and agreement was reached as to what course of action Esso should take with respect to them.

For example, it has been agreed that the Nalluk base camp be kept open through the drilling operations. It has been suggested that a polar bear protection plan be implemented. Esso has been made more aware of the difficulties of mobilizing the SSDC/MAT to the Isserk I-15 location should a relief well be considered necessary in order to stop a blow out. In particular, much information was provided by hunters and trappers concerning ice ridging problems that would prevent ice breakers from breaking through to the site once landfast ice has formed.

The value of local knowledge and expertise has been clearly demonstrated in these proceedings because of the contribution made by the Tuktoyaktuk Hunters and Trappers Committee (see Appendix E) and others. The fact that a compensation agreement between Esso and the IGC/IRC, was concluded within 24 hours of the completion of the Public Meetings shows the willingness of the parties to accommodate each others' concerns when given an opportunity to question and comment in an atmosphere that is constructive and non-adversarial.

The Board commends both the Inuvialuit and Esso for the spirit of cooperation demonstrated throughout the Public Review.

2.2 Esso's Submission

On September 20, 1989, the Environmental Impact Review Board received Esso's submission on the **Esso Chevron et al Isserk I-15 Drilling Program.**

The program description outlined in Section 2 contained a very good overview of how this project was to be carried out. Every aspect of the program was described; the requirements of regulatory approval, the drilling unit, support facilities, and the drilling operations, including well testing and final demobilization of the drilling rig.

Section 3 dealt with the geology, and described what Esso expects to find as the well is drilled. Planned Final Total Vertical Depth (FTVD) of this well is 2800 metres. At about 1300 meters (TVD), Esso expects to find gas, and lower down in the well they hope to find both oil and gas horizons. Oil flow rates for Isserk I-15 are estimated to be in the range of 336-436 cubic metres/day, and gas flow rates in the range of 98,937 - 145,886 cubic meters/day. In Esso's opinion, there is no evidence of the presence of shallow gas in the vicinity of this location.

Section 4 described the environment in which this program was to be carried out. The effects of the physical environment on the program were detailed, as were the effects of the program on the biological environment and resource use.

Section 4 dealt with potential impacts of routine activities, such as drilling, well testing, abandonment and demobilization.

Section 6 described the plans in place to deal with accidental spills from minor ones to a major blowout. Worst case scenarios were detailed for both a casing and a drill stem blowout. Spill response plans, clean up strategies, and manpower and equipment requirements were documented.

Section 7 provided the relief well strategy in the event of an uncontrolled well flow to surface that cannot be controlled by surface kill techniques or dies off due to natural bridging. In the event that a relief well is required to begin before December 10, 1989, the CANMAR SSDC/MAT would be towed to the site by icebreakers. If a blowout occurred after December 10, 1989, a spray ice island would be constructed about 500 metres from the site to act as the relief well pad.

The final section, Section 8, deals with the issue of wildlife compensation. In this section, Esso states their long standing policy regarding claims for loss or damage to wildlife harvesting activities. The process to be used in dealing with the compensation question involves the Inuvialuit Game Council entering into a wildlife compensation agreement with Esso.

2.3 Issues

The following issues were derived from the Public Review and the submissions provided to the Board by the Submitters.

2.3.1 Worst Case Scenario

Esso's position:

The Proponent's presentation of the Worst Case Scenario is based on the following four factors:

1. The nature of the hydrocarbon released.
2. The worst case mechanism for the release.
3. The release rate of the blowout.
4. The duration of the release.

1. The Nature of the Hydrocarbon Released

Esso stated that this well was expected to be a gas play. On the basis of seismic data, the primary horizon at 1300m (true vertical depth) is projected to be a gas zone. The secondary horizon, which commences between 2200m and 2300m (true vertical depth), is projected to be an oil and gas zone. Esso stated that the worst case is one in which oil, as opposed to gas, is released to the environment in a blowout.

2. The Worst Case Mechanism for the Release

Esso stated that the worst case mechanism would be a drill stem blowout. In that case, most of the oil could not be contained within the Molikpaq. The case of an uncontrolled release of oil to the sea floor outside the Molikpaq was discounted by the Proponent, due to the conservative nature of the casing program in the well bore above both the primary and secondary horizons.

3. The Release Rate of the Blowout

Esso stated that, in the worst case of a drill stem blowout, the release rates would be 3,000 barrels per day of oil and 1.5 million cubic feet per day of gas.

4. The Duration of the Release

The duration of the release, as presented by the Proponent, is determined by which relief well drilling option is chosen, and at what time of the year the blowout occurs.

In the case of a relief well drilled by the SSDC/MAT, the actual duration of the release is expected by Esso to be 75 days. At a rate of 3,000 barrels per day, a total of 225,000 barrels of oil would be released.

Within this 75 day period, 35 days are required to mobilize, tow, install equipment, and make ready to drill; and 40 days are required to control the blowout.

In the case of a relief well drilled from an ice island, the worst case release would last for 135 days and consist of 402,000 barrels of oil.

Presenters' concerns:

There are two main items to consider in a worst case blowout scenario:

1. An accurate determination of the time required to drill the relief well and complete clean up operations is fundamental.

2. Wherever possible, the blowout should not be allowed to spill oil into a predominantly water environment.

Board's analysis and conclusions:

The main concerns that arise from the Worst Case Scenario are:

1. Water should not be exposed to oil either at the freeze up or break up periods.

2. Having defined the freeze up and break up periods, a window must be identified in which it is environmentally acceptable to drill, kill, and clean up a blowout.

3. Realistic time periods for the drilling, killing, and clean up operations must be established, and these periods must be described in a manner that allows screening agencies to quickly assess the viability of any relief well and clean up operation.

Conditions:

With regard to the Worst Case Scenario, the Board recommends that the following conditions be applied by the regulatory agencies to the Isserk I-15 Drilling Program:

1. Penetration of the "Environmental Risk Zone", in this case the second horizon at between 2200-2300m, should not be allowed until sufficient ice cover to allow the containment of an oil spill from a drill stem blowout exists at the site. Verification of the ice conditions at Isserk I-15 must be conducted by the Proponent and representatives of the Tuktoyaktuk Hunters and Trappers Committee.

2. "Environmental Risk Operations", defined as any operations undertaken within the Environmental Risk Zone prior to well abandonment, shall be conducted no later than a date defined as follows:

June 15th less the sum of the time taken to drill a relief well and kill the blowout plus the time taken to carry out the oil spill cleanup operations.

2.3.2 Relief Well Capability

Esso's position:

Esso stated that both the SSDC/MAT and the spray ice island options were necessary in order to maintain the flexibility required for an immediate response. The remote chance of a blow-out occurring does not justify large expenditures in advance of drilling. The Proponent stated that only one in approximately 7000 wells experiences a blowout requiring a relief well.

The Proponent stated that the SSDC/MAT could be mobilized and towed to the Isserk I-15 location up to the time when grounded ice ridges form. Once the ridges form, a spray ice island could be built on what would by then be landfast ice. To move a portable drilling rig and all of the necessary consumables to the site, large helicopters would be contracted. Using helicopters would avoid having to wait for an ice road to be constructed.

If a blowout did occur, Esso stated that cost would not limit the necessary response. Both the construction of a spray ice island relief well pad and the mobilization of the SSDC/MAT would be initiated immediately upon occurrence of a blowout.

Submitters' Concerns

Some of the specific concerns raised with regard to the relief well issue are:

1. The Inuvialuit Game Council/ Inuvialuit Regional Corporation and the Tuktoyaktuk Hunters and Trappers Committee stated that the presence of many abandoned artificial islands in the area of Isserk I-15 would make icebreaker access very difficult and SSDC/MAT mobilization almost impossible.

2. The Inuvialuit Game Council/ Inuvialuit Regional Corporation questioned the contractor's ability to speedily resupply drilling consumables to the SSDC/MAT.

3. The Inuvialuit Game Council/ Inuvialuit Regional Corporation said that the mobilization of the SSDC/MAT to within 500 metres of the blowing well would destroy the protective sheath of ice that was the only thing keeping the oil out of the water.

4. The Inuvialuit Game Council/ Inuvialuit Regional Corporation questioned the ability of the proponent to construct an ice road to the Isserk I-15 site adequate to mobilize a drilling rig, given the problems experienced last season with the ice road to the Nipterk P-32 project and the probability of extensive ridging around Isserk I-15.

Board's Analysis and Conclusions

The Board is concerned over the ability of the operators to mobilize the SSDC/MAT to site. Even if it can be accomplished, mobilization of the SSDC/MAT to the site might destroy any protective ice cover present, thereby adding to the environmental impact of the blowout.

Based on the information cited in ATL's September, 1989 report, the towing and ice breaking scenario described by the Proponent will not be effective for the following reasons:

1. Given the probable timing of an oil blowout, the SSDC/MAT would have to be towed to the Isserk I-15 site during mid to late December.

2. To achieve the quoted towing speed of 1 knot at 8 metres draft, the necessary towing force (as stated in the ATL report) would be 500 tonnes. To even approach this speed would require the use of the Beaudril icebreakers Terry Fox and Kalvik (combined bollard pull of 400 tonnes) for towing.

   This would mean that the icebreakers Miscaroo and Ikaluk would be left with ice management duties; duties that the Terry Fox and Kalvik are better suited for. In reality, it is more likely that the Miscaroo and Ikaluk would be used to tow the SSDC/MAT, leaving ice management to the Terry Fox and Kalvik. This would have the effect of reducing the tow speed and therefore increasing the tow time by as much as 100% . The relief well would not be drilled in the time frame specified by the Proponent.

3. The ATL document says that, during the late November to late December period, four or five icebreakers would be required to do the job. It is assumed that the fifth vessel would have to be the Kigoriak, currently in McKinley Bay. This would again add more time to the relief well drilling scenario.

In response to the concerns expressed over the mobilization of the SSDC/MAT and its placement proximal to the Isserk I-15 site, including the damaging of the protective ice sheath around the Molikpaq, Esso stated that there was considerable flexibility in the location of the relief well, and that it could be situated as far as 800 - 1000 metres from the Isserk I-15 well. The Board noted that this would require an increase in the drilling angle for the relief well and would likely increase the drilling time.

The Board feels that the most likely time for an oil blowout would be mid-December. On the basis of all the information presented by Esso, at that time there would, at the very least, be total ice cover. There is a 95 - 100% likelihood of landfast ice at the Isserk I-15 site. By the time the SSDC/MAT was actually mobilized to the edge of the landfast ice nearest the location in late December, the presence of landfast ice may actually prevent access to the site.

The Board is of the opinion that, on the basis of the well timing and probable ice conditions, the SSDC/MAT does not appear to offer feasible relief well capability for Isserk I-15.

In the case of the spray ice island, there was a great deal of concern raised with regard to how early Esso could commence building the ice road to the site, and how any delay would impact on the total duration of this relief well option. Esso stated in their presentation that the equipment could be mobilized and the road could be built in a total elapsed time of three weeks. This would mean that drilling of the relief well could commence as early as late November. Again, the Board views this scenario to be very optimistic.

In response to concerns expressed in the Public Meeting, Esso insisted that, if required, Sky Crane helicopters would be mobilized to complete construction of the ice road and to transport the drilling rig.

The Board believes, in both of the relief well scenarios presented, that the 40 day interval Esso says it will take to mobilize, drill a relief well, and kill the blowout is overly optimistic.

The Board also decided that the SSDC/MAT option, given the time frame that the operator is now faced with, is not a feasible one. However, the Board respects Esso's desire to maintain flexibility.

Although the Board did not place any terms and conditions on the plans for drilling a relief well, it would have liked to see the same level of detailed information provided in relief well planning that the Proponent provided in oil spill contingency planning.

2.3.3 Contingency Planning

Proponent's Position:

1. Planning Framework:

Response to an oil spill would be guided by a planning framework which covers the mobilization of personnel, equipment, supplies, and other resources, and provides for their management and direction in a comprehensive and co-ordinated containment and clean up program. This framework is provided through:

- Beaufort Emergency Response Plan
- Beaufort Drilling Contingency Plan
- Beaufort Area Oil Spill Response Plan

As well, the particular circumstances surrounding a major spill at the Isserk I-15 location would be governed by a specific contingency plan adapted to the particular characteristics of that location and drilling program.

The Proponent explained that the actual response operations would be governed by the individual circumstances of the spill and ensuing events, but the initial response would be directed by these plans and ongoing response operations guided by them.

During the course of the Public Meeting, it was explained by COGLA that the Proponents' contingency plans are reviewed and verified by that agency, in consultation with other appropriate Government agencies and departments, prior to the issuance of the authority to commence drilling.

In addition to contingency plans, the Proponent has developed a strategy for oil spill containment and clean up governing the possibility of an oil blowout at the Isserk I-15 location.

2. Containment:

General

Oil from a blowout during the Isserk I-15 program would be contained in the core of the Molikpaq, on the surface of the ice adjacent to the Molikpaq, or encapsulated in the ice around the Molikpaq. Containment of the oil depends on the type of blowout, the volume of the oil released, and the ice conditions during the life of the blowout. In the event of a blowout which occurred prior to the formation of landfast ice, the portion of oil discharged may be found subsequently in, or on the ice in a somewhat larger area. The area affected will be determined by the movement of ice as it forms around the Molikpaq.

Casing Blowout

For a scenario involving an oil blowout through the casing, the Proponent expects that the characteristics of the blowout would involve a relatively higher volume of oil with relatively lower exit force and trajectory. In this event, the major portion of the oil will be released into, and contained within, the core of the Molikpaq. Some oil will be lost to the ice surface surrounding the Molikpaq, and some could be lost under the ice due to leakage from the base of the Molikpaq as the accumulating oil penetrates and permeates the sand at the base of the core. This latter condition is not expected by the Proponent to occur prior to 67 days from the commencement of the blowout, and can be offset by pumping oil from the core on to the adjacent ice surface (lightering).

Drill Stem Blowout

A scenario involving an oil blowout from the drill stem, because of the smaller diameter of the drill pipe, is expected by the Proponent to produce higher exit velocities but considerably lower volumes of discharged oil. In this case, the higher velocity and trajectory would result in most of the oil being deposited on the sea ice surface adjacent to the drilling platform. The extent of this oiled area is estimated to be of the order of 0.3 square kilometers.

3. Clean up:

General

In each of these scenarios, oil discharged by the blowout is anticipated to be safely contained in the Molikpaq core and on the stable landfast ice adjacent to the drilling platform. Clean up activities would not be initiated until the uncontrolled well (blowout) is brought under control (killed), and the safety of clean up personnel is assured. Actual clean up activities would be expected to begin during late March to facilitate the necessary planning, organization, and logistical support of the clean up operation.

Oil in Molikpaq Core

Oil contained in the Molikpaq core would be removed by lightering to fuel barges as soon as ice conditions allowed, probably during the summer following the blowout. Excess oil from the Molikpaq that had been lightered to the sea ice for containment during the winter would be treated in the same fashion as other oil discharged to the sea ice and/or contained on it.

Oil Contained on Landfast Sea Ice Surface

Oil contained on the surface of the landfast sea ice would be scraped up, manually and by equipment, into accumulations, and then would be burned. During the spring, after the disappearance of the snow cover, residual oil stains on the ice surface are expected to be found in surface melt pools where they can be removed by absorbents.

Oil Encapsulated in Ice

In the event that oil seeps from the base of the Molikpaq containment, the Proponent states that it will become encapsulated in the landfast ice as it forms. During the spring melt the Proponent states that this oil will migrate to the ice surface through brine channels in the ice, where it will accumulate in surface melt pools. At that stage the oil would be disposed of by burning and absorbents.

In the event of a blowout prior to the formation of landfast ice, oil deposited on the surface of the water or into a water/ice mix will be contained by the forming ice. The oil will be encapsulated within the ice as it forms. The trapped oil would be disposed of as in the case of other encapsulated oil. In this situation, however, oil might move some distance from the blowout site according to the movement patterns of the forming ice. The Proponent indicated that computer projections suggest that this distance would not be great, and that the oil could be located when it appeared in surface melt pools in the spring.

Proponent's Commitments

During the course of the Public Meeting the Proponent made a number of commitments that relate to the general matter of oil spill response and clean up.

Esso agreed that they would develop, in co-operation with the Inuvialuit Game Council and the Government of the Northwest Territories, a polar bear management plan that was capable of dealing effectively with the anticipated increase in numbers of bears attracted to the clean up site and to the oil containment area.

Esso agreed that they would introduce measures to encourage avoidance by sea birds and waterfowl of open water in leads and at flow edges. These are the areas that might be contaminated by residual quantities of oil during the spring melt and break up.

Esso agreed that they would co-operate with Government, the Inuvialuit, and other industry representatives in a workshop to review oil spill contingency planning, technology and practices.

Esso agreed that the Nalluk base facilities and oil spill co-operative facilities would be kept open during the course of the Isserk I-15 project, to ensure their immediate availability in the event of an oil spill.

Submitters' Concerns

In written submissions to the Board, and at the Public Meetings, Submitters raised a number of concerns related to the subject of contingency planning for oil spill containment and clean up as described by the Proponent.

Concerns were raised about the lack of Inuvialuit participation in the formulation, evaluation, testing and execution of industry's contingency plans.

Concerns were expressed regarding the co-ordination of oil spill response direction, management, and resources between Government and industry.

A concern was raised about the socio-economic impact upon the community of Tuktoyaktuk of an influx of media, observers, and clean up workers in the event of a major oil spill.

Concern was expressed that polar bears would be attracted to the clean up site by the activity, where they would be endangered by contact with contaminated snow or ice, or treated as dangerous bears and destroyed. Some Submitters felt that residual oil from the spill would inevitably find its way to open water leads where bears, which frequent these areas, would come in contact with it.

Concerns were stated regarding the air quality effects from the disposal of oil by burning.

A concern was expressed with regard to the overall response capability claimed by the Proponent. Submitters stated that this capability would be hampered by the oil spill co-operative facilities being closed during the well program at the Isserk I-15 location, and thereby requiring extra preparation in the event of an oil spill. The Proponent agreed to open these facilities for the duration of the well program.

Other concerns were raised regarding the level and accuracy of logistical planning for a major clean up program. Submitters felt that a much longer period of time would be required to construct an ice road to the clean up site, and that estimates of equipment, manpower and support materials involved were unrealistically low. Submitters felt that a Sky Crane helicopter must be available for initial logistical support.

Many Submitters expressed a general lack of confidence in the high percentage (98%) of evaporated and recovered oil claimed by the Proponent. Reasons cited included a view that the worst case scenario was understated, that logistic and operational problems were not adequately considered, and that clean up techniques, technology and implementation would not achieve the efficiencies and effectiveness claimed by the Proponent.

One Submitter cited the lack of an overall Government / industry policy framework for oil spill planning and countermeasures.

Board's Analysis and Conclusions

General

The Board believes that the oil spill containment and clean up scenario presented by the Proponent is a "best case" scenario with regard to the duration of the spill and volumes of oil that would therefore have to be dealt with in the containment and clean up program. The Board felt that the size of the program and logistical committment and planning required to effect the clean up was understated, while program efficiencies and effectiveness were unduly optimistic. The Board felt that while it was reasonable to expect that the major portion of oil discharged into the environment would evaporate or be recovered, the percentages claimed by the proponent were unrealistically high.

Air Quality and Socio-Economic Concerns

All of the concerns raised by Submitters were considered by the Board in the context of the information made available by the Proponent, and information derived from discussion at the Public Meetings. The concerns raised regarding air quality effects resulting from burning oil, and socio-economic effects associated with clean up, were considered to have been adequately addressed by the Proponent.

Planning

The Board felt that the logistical problems and requirements involved in a major oil spill during the Isserk I-15 program had been inadequately addressed. It was felt that logistical support for the clean up should be examined and described in greater detail, and be based upon the assumption that ice road construction would take longer and be more complex than anticipated by the Proponent.

The oil spill contingency plan should also reflect the Board's view that the oil spill could be of longer duration and involve larger quantities of oil than outlined by the Proponent. The Board concurred with those Submitters who felt that a Sky Crane helicopter should be specifically mentioned in the contingency plan, and be made available for immediate deployment in the event of a spill.

Containment

The Board felt that greater quantities of oil than estimated by the Proponent would escape to the water environment and would subsequently be found in ice leads and open water during the spring. The Board felt that the Proponent's proposed clean up program should be adjusted to take this into account, and that special measures should be developed and implemented to reduce exposure of seals, polar bears and waterfowl in these areas. The Board agreed that special measures would have to be adopted to keep polar bears away from the oil spill site during the clean up program.

Conditions

The Board concluded that a number of conditions should be attached by the appropriate regulatory body to the authority to drill a well at Isserk I-15. These are:

1. Existing contingency plans relative to a major oil spill at Isserk I-15 should be adjusted to ensure Inuvialuit participation in the determination of protection and clean up priorities, counter measure implementation and program monitoring. This should be completed and reviewed by the competent regulatory body prior to the penetration of the environmental risk zone.

2. The appropriate Government agency to monitor the clean up program implemented by the Proponent, and to assume responsibility for that program in the event it becomes necessary, should be identified to the Inuvialuit along with the name and position of the individual assigned these responsibilities by that Government agency. This should be completed prior to the penetration of the environmental risk zone.

3. In the event of a major oil spill resulting from a blowout, the clean up operation should be initiated immediately upon the successful killing of the uncontrolled well.

4. The Proponent, in consultation with the Inuvialuit Game Council, Tuktoyaktuk Hunters and Trappers Committee, Wildlife Management Advisory Council (NWT) and appropriate agencies of Government, should formulate a Polar Bear Protection Plan for implementation in the event an oil spill at Isserk I-15. This plan should be completed prior to the penetration of the environmental risk zone.

5. The Proponent should undertake, to the satisfaction of the appropriate regulatory agency, to ensure the availability of a Sky Crane helicopter for immediate logistic support in the event of a major oil spill. This availability to be secured prior to the penetration of the environmental risk zone.

6. Prior to drilling through the environmental risk zone, the oil lightering pumps described to the Board by the Molikpaq's offshore installation manager, should be both installed and tested. These pumps provide the ability to pump 10,000 barrels per day of oil out of the core of the Molikpaq onto the ice if a casing blowout were to occur.

7. The Board further sets as a condition that COGLA inspect the Molikpaq and determine that these pumps are operational and can be powered by a source of electrical or air power external to the Molikpaq, prior to the penetration of the environmental risk zone.

2.3.4 Wildlife Compensation

Statutory Provisions

Section 13 (15) of the IFA imposes absolute liability on the developer where the development project causes actual or future wildlife loss.

In the case of actual loss, the Inuvialuit harvester is entitled to compensation. Actual loss covers loss of equipment, loss or reduction of hunting, trapping or fishing income, and loss to subsistence harvesters. If compensation claims are not settled within 60 days, the Inuvialuit may resort to the Arbitration Board provided for in Section 18 of the IFA.

In the case of future harvest loss, the right of the Inuvialuit is to seek recommendations of the Arbitration Board with respect to remedial measures including clean ups, habitat restoration and reclamation. Under Section 13(16), Canada has the responsibility to assume the developer's liability for mitigative and remedial measures where the Government was involved in establishing terms and conditions for the development.

Section 13(11)(b) of the IFA requires the Board to recommend to the Government authority empowered to approve the proposed development "an estimate of the potential liability of the developer, determined on a worst case scenario, taking into consideration the balance between economic factors, including the liability of the developer to pay, and environmental factors".

Section 13(13) states that every developer must prove financial responsibility before being authorized to proceed with the development, and Section 13(14) states that the Government authority may require the developer to provide evidence of financial responsibility through a letter of credit, guarantee or indemnity bond, or any other form satisfactory to the Minister.

An examination of these provisions reveals two approaches to satisfying Inuvialuit claims for compensation. With respect to actual harvest loss, the developer is to compensate the Inuvialuit directly, with recourse to arbitration and a financial instrument to guarantee payment.

With respect to future harvest loss, the remedy of the Inuvialuit is to obtain recommendations from the Arbitration Board to the Government authority as to mitigative and remedial measures that the developer must undertake with the due performance of these measures backstopped by Canada.

In addition to recourse under the IFA, the Inuvialuit, like all Canadians, have the right to recover damages for loss to wildlife harvesting under a variety of federal statutes:

Arctic Waters Pollution Prevention Act	(AWPPA)
Oil and Gas Production and Conservation Act	(OGPCA)
Canada Shipping Act	(CSA)
Fisheries Act	(FA)

The provisions of these statutes overlap with the liability and compensation provisions of the IFA in a number of important respects so that it is generally agreed that these statutes generate much confusion. For example, there are statutory limits of absolute liability under AWPPA and OGPCA, whereas absolute liability is unlimited under the IFA.

However, the Western Arctic (Inuvialuit) Claims Settlement Act gives supremacy to the IFA over all other statutory provisions in the case where these provisions conflict with provisions of the IFA. The result is that, while Inuvialuit are not excluded from rights available under these other statutes with respect to wildlife harvesting losses, they can look to the IFA as their primary source of rights.

Compensation Issues

The compensation issues before the Board are to determine worst case estimates of wildlife liability for Isserk I-15 and to make recommendations to the Minister concerning the financial responsibility of Esso.

Esso's Environmental Impact Statement

In the Environmental Impact Statement included in the submission to the Board, Esso stated its compensation policy to be that the Company will voluntarily make compensation, with the amount of damage being negotiated directly with claimants. It put forward a draft Wildlife Compensation Agreement which it was proposing to the Inuvialuit as a means of implementing the Company's policy.

Submissions to the Board

Numerous submissions were made to the Board on the subject of compensation, mainly by the IGC/IRC and by the Tuk HTC. These submissions focussed principally on how actual harvest losses will be compensated for.

The Tuk HTC stated concerns in a straight forward fashion:

> "It (compensation) should be simple and put in place quickly. It should be easily accessible to the people - they don't want all the money to go to the lawyers and consultants. It should contain compensation options. It should be in place from the start to the end of the project."

Government Statements

The DIAND representatives present at the Public Meeting explained the current policy of the Department when determining what limits should be set for instruments of financial responsibility.

The policy is to set a limit for such instruments respecting actual harvest loss on a "case by case" basis under the IFA. This limit has been set at $5,000,000 for recent drilling projects in the region.

The Board agrees that a "case by case" approach is correct. Were it necessary to set such a limit for Isserk I-15, the Board notes that a higher figure than $5,000,000 would be appropriate considering the wildlife populations and values stated in Esso's submissions and studies.

With respect to future harvest loss, as distinguished from actual harvest loss, current regulations set the limit for northern operations under the OGPCA to be a specified amount less the limit for financial responsibility set pursuant to the AWPPA.

Because the limit under the AWPPA is $40,000,000 and the specified amount under the OGPCA is $40,000,000, the result is that the OGPCA limit is zero. The Department policy is to accept the $40,000,000 instrument received under the AWPPA as satisfying the financial responsibility requirements under the IFA.

Several Submitters questioned this arrangement because of its complexity and uncertainty. It was also argued that $40,000,000 is an insufficient limit for mitigative and remedial measures (clean up, restoration and reclamation) in the light of the recent Valdez oil spill experience.

Consequently, the Board was asked to recommend to the Minister that DIAND convene a workshop to examine all aspects of compensation and financial responsibility and to initiate necessary changes in legislation and policy.

The Board notes these difficulties and concerns and agrees that such a workshop should be convened.

Board's Conclusions

On the third day of the Public Meeting, Esso and the IGC/IRC stated their willingness to attempt to finalize negotiations concerning the draft Wildlife Compensation Agreement.

Since completion of the Public Meetings, the Board has been provided with a copy of a signed Wildlife Compensation Agreement dated October 27, 1989. Filed with the copy of the Agreement is a letter dated the same day addressed to Jim Livingstone, Chairman of the EIRB, and signed by A. Carpenter, Chairman of the IGC, and E. Bennett, Drilling Manager of Esso. This letter (Appendix J) confirms that an agreement for handling wildlife compensation claims has been reached and that this agreement "will satisfy the wildlife compensation aspects of section 13 of the IFA including the process for such claims and financial security for them". This Wildlife Compensation Agreement is on file at the offices of the Joint Secretariat in Inuvik.

The Board has reviewed the provisions of the Wildlife Compensation Agreement and is satisfied that it fulfills the requirements of the IFA in so far as direct harvest losses are concerned. The principal purpose of Section 13(11)(b) of the IFA, which requires the Board to estimate the potential liability of Esso, is to fix an amount which the Minister may use when exercising his discretion to decide whether a financial responsibility instrument is required and what its amount and terms should be.

The letter of October 27, 1989, relieves the Board from the necessity of making this estimate with respect to actual harvest loss resulting from Isserk I-15, because the parties have stated in the letter that the Wildlife Compensation Agreement is to be taken as satisfying the requirements for evidence of financial responsibility.

The Board notes that the Agreement relates solely to the Isserk I-15 Drilling Program and will terminate when that program is completed save for the filing and settlement of claims arising out of this drilling program, which claims must be notified to Esso within three years of the loss occurring [Section 13(17) of the IFA].

Board's Recommendations

1. On the basis of the letter of October 27, 1989, the Board will recommend to the Minister that no financial responsibility instrument need be required from Esso with respect to actual wildlife losses caused by Isserk I-15.

2. With respect to future wildlife losses resulting from the Isserk I-15 program, the Board recommends to the Minister that he need not require Esso to provide further evidence of financial responsibility. Both the Inuvialuit and DIAND are satisfied that Esso is financially capable of meeting any and all liabilities it may incur under the IFA with respect to future harvest losses.

3. The Board recommends to the Minister that he convene meetings of Inuvialuit, industry and government representatives within 90 days to deal with all aspects of compensation and financial responsibility under the Inuvialuit Final Agreement.

2.3.5 Routine Operations

2.3.5.1 Demobilization of Molikpaq

Proponent's Position:

Abandonment and demobilization of the drilling structure will commence in June, 1990 with de-winterizing. Following removal of the sand core, Molikpaq will be lifted off the location and towed to a new location or to Herschel Basin. Demobilization of Molikpaq is scheduled to occur in July, and will involve intensive activity over a short period.

Submitters' Positions:

The Tuktoyaktuk Hunters and Trappers Committee (Tuk HTC) and the Fisheries Joint Management Committee (FJMC) are concerned that the demobilization of the Molikpaq and ship traffic associated with that operation during July, 1990, may disturb Beluga or Beluga harvesting. At that time, the migration of Beluga Whales from Amundsen Gulf into the Mackenzie River estuary will likely be underway. There is a possibility that the migration may be disrupted, thereby delaying the entry of the whales into Mackenzie Bay or Kugmallit Bay.

Board's Analysis and Conclusions:

The Board recognizes the concerns related to the timing of rig demobilization. Removal of the Molikpaq from Isserk I-15 location will involve the use of icebreakers and/or tugs that will generate large amounts of underwater noise.

Belugas, who travel in large numbers through the Mackenzie estuary in late June and early July, are highly susceptible to disturbance by underwater noise while in ice-covered waters. The noise and activity associated with rig demobilization might disturb belugas causing reductions in the success of Inuvialuit hunters and or deter the whales from entering the estuary and receiving the benefits of estuary use.

Condition:

Demobilization plans must be based on actual ice conditions and whale migration patterns observed during regular survey flights in June-July of 1990. These plans are to be developed between the FJMC and the Proponent, and agreed upon prior to any demobilization of the Molikpaq.

2.3.5.2 Ship Tracks in Tuk Harbour

The Tuktoyaktuk Hunters and Trappers Committee expressed strong disappointment over the fact that the issue of ship tracks in the harbour has never been resolved.

Briefly stated, the hunters and trappers cannot cross the ice in the harbour after a ship has broken the ice to enter or exit the harbour. The problem exists in late September, October and early November when various oil companies arrange to have their drilling consumables moved from the staging bases in Tuktoyaktuk to their staging bases offshore.

In questioning various regulators, no Government department could be identified by the Board as having a regulatory responsibility to deal with this issue. Although it may seem a small issue, the hunters and trappers in Tuktoyaktuk consider it a major source of inconvenience and annoyance.

When the harbour cannot be crossed because of these ship tracks, the hunters and trappers must drive their snowmobiles around the entire harbour, thereby using extra fuel and adding a considerable amount of time to what may have already been a long journey.

The Board deals with this issue in the Decision section of this report.

3.0 DECISION OF THE BOARD

The Board is satisfied that it can approve the Isserk I-15 Drilling Program, without holding a full public hearing, subject to the following terms, conditions and recommendations:

3.1 Conditions

1. Penetration of the "Environmental Risk Zone", in this case the second horizon between 2200-2300m, should not be allowed until sufficient ice cover to allow the containment of an oil spill from a drill stem blowout exists at the site. Verification of the ice conditions at Isserk I-15 must be conducted by the Proponent and representatives of the Tuktoyaktuk Hunters and Trappers Committee.

2. "Environmental Risk Operations", defined as any operations undertaken within the Environmental Risk Zone prior to well abandonment, shall be conducted no later than a date defined as follows:

   June 15th less the sum of the time taken to drill a relief well and kill the blowout plus the time taken to carry out the oil spill cleanup operations.

3. Existing contingency plans relative to a major oil spill at Isserk I-15 should be adjusted to ensure Inuvialuit participation in the determination of protection and clean up priorities, counter measure implementation and program monitoring. This should be completed and reviewed by the competent regulatory body prior to the penetration of the environmental risk zone.

4. The appropriate Government agency to monitor the clean up program implemented by the Proponent, and to assume responsibility for that program in the event it becomes necessary, should be identified to the Inuvialuit along with the name and position of the individual assigned these responsibilities by that Government agency. This should be completed prior to the penetration of the environmental risk zone.

5. In the event of a major oil spill resulting from a blowout, the clean up operation should be initiated immediately upon the successful killing of the uncontrolled well.

6. The Proponent, in consultation with the Inuvialuit Game Council, Tuktoyaktuk Hunters and Trappers Committee, Wildlife Management Advisory Council (NWT) and appropriate agencies of Government, should formulate a Polar Bear Protection Plan for implementation in the event an oil spill at Isserk I-15. This plan should be completed prior to the penetration of the environmental risk zone.

7. The Proponent should undertake, to the satisfaction of the appropriate regulatory agency, to ensure the availability of a Sky Crane helicopter for immediate logistic support in the event of a major oil spill. This availability to be secured prior to the penetration of the environmental risk zone.

8. Prior to drilling through the environmental risk zone, the oil lightering pumps described to the Board by the Molikpaq's offshore installation manager, should be both installed and tested. These pumps provide the ability to pump 10,000 barrels per day of oil out of the core of Molikpaq onto the ice if a casing blowout were to occur.

9. The Board further sets as a condition that COGLA inspect the Molikpaq to determine that these pumps are operational and can be powered by a source of electrical or air power external to the Molikpaq, prior to the penetration of the environmental risk zone.

10. Demobilization plans for the Molikpaq must be based on actual ice conditions and whale migration patterns observed during regular survey flights in June and July of 1990. These plans are to be developed between the Fisheries Joint Management Committee and the Proponent, and agreed upon prior to any demobilization of the Molikpaq.

3.2 Recommendations

1. On the basis of the letter of October 27, 1989, from the Inuvialuit Game Council and the Proponent, the Board will recommend to the Minister that no financial responsibility instrument need be required from Esso with respect to actual wildlife losses caused by Isserk I-15.

2. With respect to future wildlife losses resulting from the Isserk I-15 project, the Board recommends to the Minister that he need not require Esso to provide further evidence of financial responsibility. Both the Inuvialuit and DIAND are satisfied that Esso is financially capable of meeting any and all liabilities it may incur under the IFA with respect to future harvest losses.

3. The Board recommends to the Minister that he convene meetings of Inuvialuit, industry and government representatives within 90 days to deal with all aspects of compensation and financial responsibility under the Inuvialuit Final Agreement.

3.3 General Observations

The following is a series of recommendations that the Board would like to pass on to the Minister that are not bound by Section 11(29) of the Inuvialuit Final Agreement.

1. The Board recommends that a series of meetings be held on the subject of same season relief well policy for offshore Beaufort Sea wells. Participants should include representatives from the Inuvialuit, companies holding exploration agreements for the Beaufort Sea, COGLA, Canadian Coast Guard and the Government of the Northwest Territories.

   In his letter to the Board on September 20, 1989, Mr. M.E. Taschereau of COGLA offered to convene a round table on this subject. The Board would like to see the first of these meetings take place before December 31, 1989.

2. The Board recommends that COGLA and the Canadian Coast Guard investigate the concern expressed by the Tuktoyaktuk Hunters and Trappers Committee that the landfast ice is being seriously affected by abandoned artificial islands in the Beaufort Sea. The results of that investigation should be made available to the Tuktoyaktuk Hunters and Trappers Committee.

3. The Board recommends that the Minister request the three major oil companies causing ships' tracks in the ice at Tuktoyaktuk harbour to create a special compensation fund to deal with this problem.

   The fund should be set up by having Esso, Gulf and Amoco each contribute $5,000. The Tuktoyaktuk Hunters and Trappers Committee would administer this fund; and by December 31st of each year, the Committee would provide to these companies full accounting of all compensation claims paid out of the fund. By September 1st of each year, the fund would be topped up to the original $15,000, and this cost shared equally by the three oil companies.

4. The Board recommends that all applications for Authority to Drill a Well (ADW) in the Beaufort Sea contain a detailed relief well plan and oil spill containment and clean up plan when submitted to the Environmental Impact Screening Committee.

5. The Board recommends that the industry, government and the Inuvialuit Game Council develop a "Polar Bear Protection Plan." The purpose of this plan is to provide mechanisms to protect polar bears near oil spills. Oil spill contingency plans for the Beaufort area should incorporate this Polar Bear Protection Plan by no later than July 1, 1990.

6. The Board recommends that the Beaufort Sea operators, COGLA and the Canadian Coast Guard undertake the publication of a brochure that describes how the Government of Canada and the oil industry would respond to a worst case spill in the Beaufort Sea.

7. The Board recommends that more local people in the Inuvialuit Settlement Region are trained in oil spill response techniques. In the event of a major spill, the local people will be the most valuable clean-up resource. Over the past ten years, only 75 local people have been trained in oil spill clean-up measures. This number is far too low considering the amount of manpower that would be required in the event of a major oil spill.

   The success of oil spill containment and cleanup in the offshore arctic environment depends on the practicality of the countermeasures on landfast ice, moving ice, and ice infested or open waters.

   Inuvialuit hunters and trappers have an intimate knowledge of these offshore environments, and a strong vested interest in the success of proposed countermeasures.

8. The Board recommends that the Inuvialuit be involved in contingency planning from the earliest stages of the project design. This will improve the workability of proposed measures and give industry, the Inuvialuit and government agencies a better appreciation of the problems involved.

9. The Board recommends that the operational testing of the burning of crude oil on Beaufort Sea landfast ice be conducted by industry and government agencies. As this method is the preferred countermeasure for major spills in landfast ice, operational testing involving the Inuvialuit would demonstrate just how effective this countermeasure really is.

10. The Board recommends that the Environmental Studies Revolving Fund (ESRF) assign a priority to research on oil spill clean up technology, the effects of oil on wildlife and wildlife habitat in the Beaufort Sea.

Environmental Impact Review Board November 1, 1989

James I. Livingstone
Chairman

Ewan Cotterill
Member

Nelson Green
Member

Ron D. Livingston
Member

Calvin Pokiak
Member

APPENDIX A

PUBLIC NOTICE

DATED AT INUVIK, NORTHWEST TERRITORIES,
SEPTEMBER 24, 1989

A Public Review of the development proposal known as the Esso Chevron et al Isserk I-15 Drilling Program, proposed for the Beaufort Sea north of Pullen Island, has been initiated by the Environmental Impact Review Board. This Public Review is being held pursuant to the **Inuvialuit Final Agreement** which has been approved, given effect and declared valid by the **Western Arctic (Inuvialuit) Claims Settlement Act**, being Chapter 24 of the Statutes of Canada 32-33, Elizabeth II (1984).

The Public Review will commence with a public meeting to be held at Kitti Hall in the Hamlet of Tuktoyaktuk, beginning at 9:30 a.m. local time on Tuesday, October 24, 1989 and continuing thereafter as may be necessary.

The purpose of this public meeting is to review the potential environmental effects of the proposed Drilling Program to determine whether the Environmental Impact Review Board should:

(i) reject the proposal
(ii) approve the proposal subject to terms and conditions, or
(iii) require that the proposal be subject to further review by convening a public hearing.

Should the Environmental Impact Review Board approve the proposal following the public meeting, it will, on the basis of the evidence and information before it, make recommendations to the government authorities empowered to approve the proposal concerning:

(i) Terms and Conditions relating to the mitigative and remedial measures that it considers necessary to minimize any negative impact on wildlife harvesting,
(ii) An estimate of the potential liability of the developer, determined on a worst case scenario, and taking into consideration the balance between economic factors, including the ability of the developer to pay, and environmental factors.

Organizations, government agencies, and members of the public are invited to attend the public meeting to make submissions to the Environmental Impact Review Board concerning these matters and the recommendations which the Environmental Impact Review Board should make.

The Environmental Impact Review Board requests that those individuals and/or organizations intending to make submissions should file with the Secretary of the Environmental Impact Review Board a letter stating this intention, together with ten (10) copies of the submission itself, on or before Tuesday, October 14, 1989. Individuals who have not given advance notice may make oral submissions to the public meeting after all others have been heard.

Copies of the Esso Chevron et al Isserk I-15 submission, which describes the proposed project and analyzes the potential environmental effects, are available for examination during normal business hours at the offices of the Joint Secretariat, 107 Mackenzie Road, Inuvik, Northwest Territories, and at the offices of the Hamlet of Tuktoyaktuk.

Anyone wishing further information concerning this public review, or who would like a copy of the Environmental Impact Review Board's **Operating Procedures**, should contact:

Secretary, Environmental Impact Review Board
PO Box 2060
Inuvik, Northwest Territories, X0E 0T0
Telephone: (403) 979-2828
Telecopier: (403) 979-2610

APPENDIX B

ESSO DISTRIBUTION LIST

The Environmental Impact Review Board Submission (Esso's Environmental Impact Statement) was sent to the following:

Name	Copies	Date
Charalyn Krize Head of Ocean Dumping & Marine Program Hull, Quebec	1	27/09/89
Art Webster, Minister Department of Economic Development Yukon Territorial Government Whitehorse, Yukon	1	27/09/89
Andre D'Entremont Chief of Environmental Quality Yellowknife, N.W.T.	1	27/09/89
Tim Coleman, Manager Conservation and Environmental Protection Inuvik, N.W.T.	1	27/09/89
Angus Robertson, Director Renewable Resources and Environment Department of Indian Affairs and Northern Development Yellowknife, N.W.T.	1	27/09/89
Hiram Beaubier, Director General Natural Resources and Economic Development Northern Affairs Program Department of Indian Affairs and Northern Development Hull, Quebec	1	27/09/89
M. Thomas, Regional Engineer Canada Oil and Gas Lands Administration Yellowknife, N.W.T.	1	27/09/89
M.E. Tashereau, Administrator Canada Oil and Gas Lands Administration Ottawa, Ontario	1	27/09/89
Jim McTaggart-Cowan, Director Energy, Mines and Resources Ottawa, Ontario	1	27/09/89

Name	Copies	Date
Janet Bourassa, Chief NWPA Program Division Canadian Coast Guard Ottawa, Ontario	1	27/09/89
Reg Watkins Area Office for Navigable Waters Canadian Coast Guard North Vancouver, B.C.	1	27/09/89
Gordon Kerr, Regional Director Canadian Wildlife Service Department of the Environment Edmonton, Alberta	1	27/09/89
Gary Wagner, Secretary Environmental Impact Review Board Inuvik, N.W.T.	1	27/09/89
Lindsay Staples Wildlife Management Advisory Council (NS) Whitehorse, Yukon c/o Gary Wagner	1	27/09/89
John Bailey Wildlife Management Advisory Council (NWT) Inuvik, N.W.T. c/o Gary Wagner	1	27/09/89
Bob Bell Fisheries Joint Management Committee Lac La Ronge, Saskatchewan c/o Gary Wagner	1	27/09/89
Roger Gruben, Chief Councillor Inuvialuit Regional Corporation Inuvik, N.W.T. c/o Gary Wagner	1	27/09/89
Andy Carpenter, Chairman Inuvialuit Game Council Inuvik, N.W.T. c/o Gary Wagner	1	27/09/89
Eileen Gour Esso Resources Canada Limited Inuvik, N.W.T.	1	27/09/89

Name	Copies	Date
Billy Day, President Hunters and Trappers Committee Inuvik, N.W.T. c/o Eileen Gour	1	27/09/89
John Lucas, President Hunters and Trappers Committee Sachs Harbour, N.W.T. c/o Eileen Gour	1	27/09/89
David Ruben, President Hunters and Trappers Committee Paulatuk, N.W.T. c/o Eileen Gour	1	27/09/89
President Hunters and Trappers Committee Holman Island, N.W.T. c/o Eileen Gour	1	27/09/89
President Hunters and Trappers Committee Aklavik, N.W.T. c/o Eileen Gour	1	27/09/89
Frank Pokiak, President Hunters and Trappers Committee Tuktoyaktuk, N.W.T. c/o Eileen Gour	1	27/09/89
Jane Bicknell, Administrator Inuvialuit Land Administration Tuktoyaktuk, N.W.T. c/o Eileen Gour	1	27/09/89
Randal Pokiak, Mayor Hamlet of Tuktoyaktuk Tuktoyaktuk, N.W.T. c/o Eileen Gour	2	27/09/89
Rudy Cockney Department of Indian Affairs and Northern Development Inuvik, N.W.T. c/o Eileen Gour	1	27/09/89

Name	Copies	Date
Vic Gillman, District Manager Department of Fisheries & Oceans Inuvik, N.W.T. c/o Eileen Gour	1	27/09/89
Peter Higgins, Director General Environment Canada Conservation and Protection Branch Ottawa, Ontario	1	27/09/89
Park Sullivan Department of Indian Affairs and Northern Development Hull, Quebec	1	27/09/89
Mel Smith, Director Pollution Control Department of Renewable Resources G.N.W.T. Yellowknife, N.W.T. c/o C. Duschenes	1	04/10/89
Keith Lloyd, Director Wildlife Management Division Department of Renewable Resources G.N.W.T. Yellowknife, N.W.T. c/o C. Duschenes	1	04/10/89
Dave Jones, Director Land Use Planning Department of Renewable Resources G.N.W.T. Yellowknife, N.W.T. c/o C. Duschenes	1	04/10/89
George Patterson Energy Mines and Petroleum Resources Yellowknife, N.W.T. c/o C. Duschenes	1	04/10/89
Kit Spence, Director Oil, Gas and Mining Department of Economic Development and Tourism G.N.W.T. Yellowknife, N.W.T. c/o C. Duschenes	1	04/10/89

Name	Copies	Date
Christopher Duschenes Policy and Planning Division Department of Renewable Resources G.N.W.T. Yellowknife, N.W.T.	0	04/10/89
V. Lafferty, Director General Environmental Protection Branch Canada Oil and Gas Lands Administration Ottawa, Ontario c/o F.H. Lepine	1	05/10/89
G. Burton Ayles, Director Fisheries Habitat and Management Department of Fisheries & Oceans Winnipeg, Manitoba	1	05/10/89
F.H. Lepine Exploration Engineering Engineering Branch Canada Oil and Gas Lands Administration Ottawa, Ontario (2 copies SSDC Relief Well Report)	1	05/10/89
Jeff Stein, Head Resource Impact Section Fisheries & Oceans Winnipeg, Manitoba	1	05/10/89
Brian Smiley Senior Marine Advisor Institute of Oceans Sciences Sidney, B.C.	1	05/10/89
	42 total	

APPENDIX C

List of submitters

Canadian Arctic Resources Committee

Fisheries Joint Management Committee

Government of the Northwest Territories

Inuvialuit Game Council/Inuvialuit Regional Corporation

Tuktoyaktuk Hunters and Trappers Committee

Wildlife Management Advisory Council (North Slope)

APPENDIX D

Documents list

Exhibit no.	
A-1	Documents establishing Jurisdiction of Board
A-1-1	Inuvialuit Final Agreement
A-1-2	Western Arctic (Inuvialuit) Final Agreement Act
A-1-3	By-law #1 of Environmental Impact Review Board
A-1-4	Operating Procedures
A-1-5	Referral letter dated Aug 30/89 from EISC to EIRB
A-1-6	Supplementary referral letter dated Sept 14/89
A-1-7	Letters of P. Sullivan and M. Thomas re: "Same season relief well capability"
A-1-8	Minutes of EISC meeting re: referral
A-1-9	Esso's project description
A-1-10	Letter dated Sept 23/89 appointing E. Cotterill to the Review Panel
A-1-11	Letter dated Sept 23/89 appointing N. Green to the Review Panel
A-1-12	Letter dated Sept 23/89 appointing R. Livingston to the Review Panel
A-1-13	Letter dated Sept 23/89 appointing C. Pokiak to the Review Panel
A-1-14	Public notice of meeting
A-1-15	Opening remarks of Chairman
A-1-16	Agenda for public meetings
A-2	EIRB Correspondence
A-2-1	Letter dated Sept 6/89 from J. Livingstone to B. Misener (Esso) re: public review

A-2-2	Letter dated Sept 26/89 informing re: public review to Honourable L. Bouchard
A-2-3	Same letter to Honourable P. Cadieux
A-2-4	Same letter to Honourable J. Epp
A-2-5	Letter dated Sept 27/89 from J. Livingstone to M.E. Taschereau, COGLA, explaining public review
A-2-6	Same letter to P.H. Beaubier, DIAND
A-2-7	Same letter to C. Stephenson, Canadian Coast Guard
A-2-8	Letter dated Sept 29/89 from J. Livingstone to M. Fingas, Environment Canada, requesting review of Esso submission
A-2-9	(See E-1-3)
A-2-10	(See H-1-1)
A-2-11	Letter dated Oct 4/89 from A. Thompson to R. Pittman (Esso) requesting supplementary filing re: compensation
A-2-12	Letter dated Oct 11/89 from A. Thompson to C. Stephenson re: questions concerning shipping
A-2-13	Letter dated Oct 18/89 from G. Wagner to V. Lafferty (COGLA) enclosing a copy of written questions to Esso.
A-2-14	(See F-1-1)
A-2-15	(See G-1-1)
A-2-16	Same letter to L. Goulet (Environment Canada)
A-2-17	Same letter to G. Kerr (Canadian Wildlife Service)
A-2-18	Same letter to P. Beaubier (DIAND)
A-2-19	Same letter to C. Stephenson (CCG)
A-2-20	Same letter to B. Wong (Fisheries and Oceans)
A-2-21	Letter dated Oct 18/89 from J. Livingstone to H. Beaubier (DIAND) identifying matter of concern to EIRB
A-3	<u>EIRB reports</u>
A-3-1	Report dated Oct 16/89 from E. Owens re: Esso submission

A-3-2	C.V. of E. Owens
A-3-3	Report of R.A. Davis dated Oct 19/89 re: Esso submission
A-3-4	C.V. of R.A. Davis
A-3-5	Report of W. Scott dated Oct 21/89 re: Esso submission
A-3-6	C.V. of W. Scott
A-4	<u>EIRB written questions directed to Esso</u>
A-4-1	List no. 1, Oct 5/89
A-4-2	List no. 2, Oct 12/89
A-4-3	List no. 3
A-4-4	List no. 4
B-1	<u>Esso's submissions</u>
B-1-1	Environmental Impact Statement dated September 20/89
B-1-2	Supplementary submission re: compensation by W. Duval
B-1-3	Esso Oil Spill Contingency Plans
B-1-4	Esso submission dated Oct 24/89
B-1-5	Esso presentation panel and advisors
B-1-6	Beaufort Drilling Contingency Plan, Isserk I-15
B-1-7	Letter dated Oct 27/89 re: Wildlife Compensation Agreement
B-2	<u>Esso's answers to written questions</u>
B-2-1	Answers to List #1, Oct 12/89
B-2-2	Answers to List #2, Oct 12/89
B-2-3	Answers to List #3, Oct 16/89
B-2-4	Answers to List #4
B-3	<u>Esso's consultants: C.V.s</u>
B-3-1	David Dickens

B-3-2	Ian A. Buist, P. Eng.
B-3-3	David J. Thomas
B-3-4	Wayne S. Duval, Ph.D.
B-3-5	Exhibit "Hypothetical Oil Spill and Clean-up Response Impacts" as basis for zones of influence (Wayne S. Duval)
B-3-6	Diagram by Dr. Ron Goodman to show fate of oil spilled
D-1	Inuvialuit Game Council/Inuvialuit Regional Corporation (IGC/IRC)
D-1-1	Submission dated Oct 24/89
D-1-2	IRC submission to Public Review Panel on Tanker Safety and Marine Spills Response Capability
D-1-3	Exxon Valdez Oil Spill, Report to President
D-1-4	Effect of Crude Oil on Polar Bears, Environmental Studies #24, Environment Canada
D-1-5	Assessment of the Polar Bear population in the Eastern Beaufort Sea, March 1988, Environment Canada
D-1-6	Stirling, Attraction of Polar Bears, 1988
D-1-7	Polar Bear Management agreement for the Southern Beaufort Sea, IGC and North Slope Borough, Jan 1988
D-1-9	IGC/IRC Final Submission
E-1	Canada Oil and Gas Lands Adminstration (COGLA)
E-1-1	Overview of regulatory regime re: spills
E-1-2	Letter dated Oct 20/89 from G. Yungblut to J. Livingstone re: MODU Kulluk gas blowout
E-1-3	Letter dated Sept 20/89 from M.E. Taschereau to G. Wagner commenting on referral
E-1-4	COGLA policy on Relief Well Drilling: Beaufort Sea: a commentary. Oct/89
E-1-5	COGLA Contingency Plan, 1988
E-1-6	Processing of Drilling Applications, F. Lepine

E-1-7 Compensation Information and Procedures Respecting Damages Relating to Offshore Petroleum Activity, January 1989.

F-1 Department of Indian Affairs and Northern Development (DIAND)

F-1-1 Letter dated Oct 17/89 from P. Beaubier to J. Livingstone re: role of Northern Affairs Program (DIAND)

G-1 Department of Environment (Environmental Protection and Canadian Wildlife Service)

G-1-1 Letter dated Oct 17/89 from M. Fingas to J. Livingstone commenting on accidental spills portion of Esso submission

G-1-2 EPS submission, Tim Coleman, dated Oct 23/89

H-1 Minister of Transport (MOT)(Canadian Coast Guard)

H-1-1 Letter dated Oct 3/89 from C. Stephenson (CCG) to J. Livingstone re: shipping aspects

H-1-2 Letter dated Oct 23/89 from C. Stephenson to A. Thompson

H-1-3 Letter dated Oct 23/89 from Thorne to J. Livingstone re: Kulluk gas blow-out and correcting letter

I-1 Department of Fisheries and Oceans (DFO)

I-1-1 Submission dated Oct 23/89

J-1 Government of the Northwest Territories (GNWT)

J-1-1 Letter dated Oct 2/89 notifying intent to submit

J-1-2 Submission dated Oct 24/89

J-1-3 Final submission letter

K-1 Canadian Arctic Resources Committee (CARC)

K-1-1 Submission dated Oct 12/89

L-1	Fisheries Joint Management Committee (FJMC)
L-1-1	Submission dated Oct 13/89
M-1	Wildlife Management Advisory Council (North Slope) (WMAC(NS))
M-1-1	Letter dated Oct 17/89 notifying intent to submit
M-1-2	Submission by WMAC(NS) (withdrawn)
N-1	Tuktoyaktuk Hunters and Trappers Committee
N-1-1	Letter dated Oct 13/89 notifying intent to submit
N-1-2	Submission by Mayor of Tuktoyaktuk dated Oct 20/89
N-1-3	Tuktoyaktuk HTC submission
N-1-4	Exhibit "Extent of land fast ice": testimony of Fred Wolki

APPENDIX E

Tuktoyaktuk Hunters and Trappers Committee's presentation

1. Ship traffic

- It is mostly a problem in fall time. It could be a problem all winter for Polar Bear hunters.
- Hunters are prevented from going where they want to. They have to go the long way around.
- These openings cause extra time, extra gas, wear and tear on skidoos. It also creates the potential loss of equipment, and even loss of life.
- Ship traffic has been recognized as a problem by industry since the late 1970s when they gave cash as compensation to the hunters and trappers. This approach has never been properly addressed.
- When the industry was confronted with the problem, no one in industry would take the responsibility towards resolving it.
- We know there are some designs, like plastic bridges, that have been tested.
- We would like to have Esso and other operators meet with the hunters and trappers to resolve this long outstanding issue.

2. Oil spill cleanup

- We are very concerned about a major oil spill because it will affect us for generations.
- We don't believe that industry has the ability to clean up an oil spill in arctic waters, especially during winter months.
- Dispersants are not a solution in oil spill cleanup, for they cause more problems than they solve.

We have three recommendations regarding oil spills.

1. We recommend winter experiments to find out ways to clean up oil. These experiments were done in the past, but there may be new ways to do this now.

2. The company should have some kind of cash fund in place to cover the costs of clean up.

3. Someone clearly has to be in charge of an oil spill clean up. Maybe there could be an independent government agency with this responsibility.

3. Relief well capability

- In the past, Beaufort operators used to shut down from about November to April. We would like an explanation from the government why this policy was changed.

- Esso says in their submission that they have the capability for a relief well. We are concerned that their options are not realistic. We don't think the SSDC could be used because of the shallow water depth and that it will take a long time to get it to the site.

- For an ice island, it will take a long time to build one. The ice will not be stable enough for building an ice road until at least January.

- We are concerned that Esso could not drill a relief well at the same time they are in oil-bearing areas.

- If Esso is sure that the SSDC can be used for a relief well, it should be on site before they start drilling. If it is not on site, Esso should delay their drilling until relief well capability is certain.

- We would like to see relief well capability within 40 days, no matter what system is used.

4. Compensation

- All of the topics in our presentation are related to compensation.

- A blowout of any proportion resulting in an oil spill will affect our community's ability to harvest wildlife for the immediate future, and possibly for generations.

- We want to see a comprehensive compensation package in place before drilling starts.

- If there is a major accident, we want financial compensation for the loss of harvesting opportunities.

- We are not trying to put a price on wildlife, but we want to encourage companies to be more careful.

Any compensation package should have the following features:

- It should be simple and put in place quickly.

- It should be easily accessible to the people. We don't want all the money to go to lawyers and consultants.

- It should contain different ways to replace what is lost.

- It should be in place for the whole life of the project - from the time they spud until the well is pumped dry.

APPENDIX F

Key Issues

1. Worst Case Scenario:

   (a) Can Esso justify its claim to contain and clean up substantially all of the oil spilled in the event of a blowout?

   (b) Are even worse case scenarios within the bound of possibility?

   (c) Should Esso be required to initiate its spill response measures on site immediately a spill or blow out occurs, instead of waiting for March or April?

2. Relief Well Capability:

   (a) Should penetration of the "risk zone" be delayed until the ice around the site is definitely land fast, so that a relief well ice pad can be constructed, or any oil spilled will be contained on the ice surface?

3. Contingency Planning:

   (a) What clean up procedures and standards are required?

   (b) What is the availability of training and equipment?

   (c) Who is in charge?

4. Estimate of Liability under Worst Case Scenario:

   (a) What is the liability of Esso for:

   - the cost of mitigative and remedial measures,
   - the cost of restoration of habitat and wildlife resources,
   - the loss of actual and future wildlife harvesting.

   (b) How should these costs and losses be recovered?

   (c) What financial instruments should be in place to accomplish this?

APPENDIX G

Definition of terms

The following terms are further defined:

BLOWOUT - Uncontrolled flow of gas, oil or other well fluid from a well during drilling due to formation pressure exceeding the pressure exerted by the column of drilling mud.

BLOWOUT PREVENTER - Hydraulically or mechanically actuated high pressure valve installed at the wellhead to control pressure within the well.

BOLLARD PULL - This term defines in tonnes the ability of a vessel to tow another unit. Bollard pull should be greater than towing resistance for a tow to be achieved.

CAP GAS - Natural gas trapped in the upper part of reservoir and remaining separate from any crude oil, salt water or other liquids in the well.

CASING - Steel pipe, threaded together and cemented into a well as drilling progresses to prevent the wall of the hole caving in during drilling and to provide a means of extracting oil/gas is the well is productive.

CASING STRING - Total metre of casing run in a well.

CIRCULATE - Cycling of the drilling fluid through the drilling string and well bore while drilling is temporarily suspended. This is done to condition the drilling fluid and well bore before drilling proceeds.

COMPLETE A WELL - Finish the work on a well and bring it to a productive state.

CORE - This term is used as it relates to the Molikpaq. The core of the Molikpaq is the hollow centre of the unit which is filled with sand in order to provide sliding resistance against ice forces.

CUBIC METRE - This replaces the previous standard unit of measurement known as a barrel, which was equivalent to 35 Imperial gallons or 42 U.S. gallons. The cubic metre equals approximately 6.2897 barrels.

DEVELOPMENT WELL - Well drilled for oil and gas within a proven field or area for the purpose of completing the desired pattern of production.

DIRECTIONAL DRILLING - Controlled drilling at a specified angle from the vertical.

DISCOVERY WELL - Exploratory well which discovers a new oil/gas field.

DOWN TIME - When a rig operations are temporarily suspended because of repairs or maintenance.

DRILL PIPE - Steel pipe, in approximately 9 metre lengths, screwed together to form continuous pipe extending from the drilling rig to the drilling bit at the bottom of the hole. Rotation of the drill pipe and bit causes the bit to bore through the rock.

DRILL STEM TEST (DST) - Conventional method of testing a formation to determine its potential productivity before installing production casing in a well. A testing tool is attached to the bottom of the drill pipe and placed opposite the formation to be tested which has been isolated by placing packers above and below the formation. Fluids in the formation are allowed to flow up through the drill pipe, by establishing an open connection between the formation and the surface.

DRILL STRING - String of individual joints of pipe that extends from the bit to the kelly and carries the mud down to, and rotates the bit.

DRILLING FLUIDS - While a mixture of clay and water is the commonest drilling fluid, wells can also be drilled with air, natural gas, oil or plain water as the drilling fluid.

DRY HOLE - Generally refers to any well that does not produce oil or gas in commercial quantities.

DUAL COMPLETION - Completion in a well in which two separate formations may be produced at the same time. Production from each zone is segregated by running two tubing strings with packers, or running one tubing string with a packer and producing the other zoned through the annulus.

ENVIRONMENTAL RISK ZONE - This term refers to the depth in the well which oil is expected to be found. Oil is accepted as the main environmental pollutant. The environmental risk zone on Isserk I-15 is expected to be in the 2200-2300m true vertical depth region.

ENVIRONMENTAL RISK OPERATIONS - This terms defines any operation, either drilling, testing or evaluation which occurs below the environmental risk zone prior to abandonment of the well.
GAS PLAY - a gas play in this context consist of an exploration in which the primary reason for drilling the well is to find gas.

RISK ZONE - This term refers to the depth in the well below which hydrocarbons, either gas or oil, can be found. This depth is determined by a review of seismic and nearby well information.

SKYCRANE - This terms refers to an extremely heavy lift helicopter which may well be required to airlift heavy loads to site in event of a blowout.

APPENDIX H

Glossary of acronyms

AWPPA	Arctic Waters Pollution Prevention Act
ABS	American Bureau of Shipping
ADW	Authority to Drill a Well
BOP	Blow Out Preventer
CPA	Canadian Petroleum Association
CCG	Canadian Coast Guard
CPRA	Canada Petroleum Resources Act
CARC	Canadian Arctic Resources Committee
CASPPR	Canadian Arctic Shipping Pollution Prevention Regulations
COGLA	Canadian Oil and Gas Lands Administration
DOE	Department of Environment
DFO	Department of Fisheries and Oceans
DIAND	Department of Indian Affairs and Northern Development
DND	Department of National Defence
DPAA	Drilling Program Approval Application
DPA	Drilling Program Approval
EISC	Environmental Impact Screening Committee
EIRB	Environmental Impact Review Board
EMR	Energy Mines and Resources
ESRF	Environmental Studies Revolving Fund
FJMC	Fisheries Joint Management Committee
GNWT	Government of Northwest Territories
HTC	Hunters and Trappers Committee
IDC	Inuvialuit Development Corporation
IFA	Inuvialuit Final Agreement
IGC	Inuvialuit Game Council
IRC	Inuvialuit Regional Corporation
MOT	Ministry of Transport
MODU	Mobile Offshore Drilling Unit
NS	North Slope
OGPCA	Oil and Gas Production and Conservation Act
RERC	Regional Environmental Review Committee

SSDC	Single Steel Drilling Caison
WTA	Well Tenure Agreement
WMAC	Wildlife Management Advisory Council
WMAC(NS)	Wildlife Management Advisory Council North Slope
YTG	Yukon Territorial Government

APPENDIX I

Participants of the Public Review

Inuvialuit Game Council/Inuvialuit Regional Corporation

Fisheries Joint Management Committee

Wildlife Management Advisory Council (North Slope)

Canadian Arctic Resources Committee

Tuktoyaktuk Hunters and Trappers Committee

Hamlet of Tuktoyaktuk

Government of the Northwest Territories

Canada Oil and Gas Land Administration

Department of Environment

Department of Indian Affairs and Northern Development

Canadian Coast Guard

Department of Fisheries and Oceans

ac
27 B
28 October 1989

APPENDIX J

Environmental Impact Review Board
Inuvik, N.W.T.
XOE OTO

Attention: Jim Livingstone
Chairman

Dear Sirs:

Re: Esso Resources Proposed Isserk I-15 Well
Wildlife Compensation Agreement

We are pleased to confirm that Esso Resources Canada Limited and the Inuvialuit Game Council have reached an agreement with respect to the handling of wildlife compensation claims for the proposed Isserk I-15 Exploration Well Project. We believe the agreement reached will satisfy the wildlife compensation aspects of Section 13 of the Inuvialuit Final Agreement including the process for such claims and financial security for them.

Yours truly,

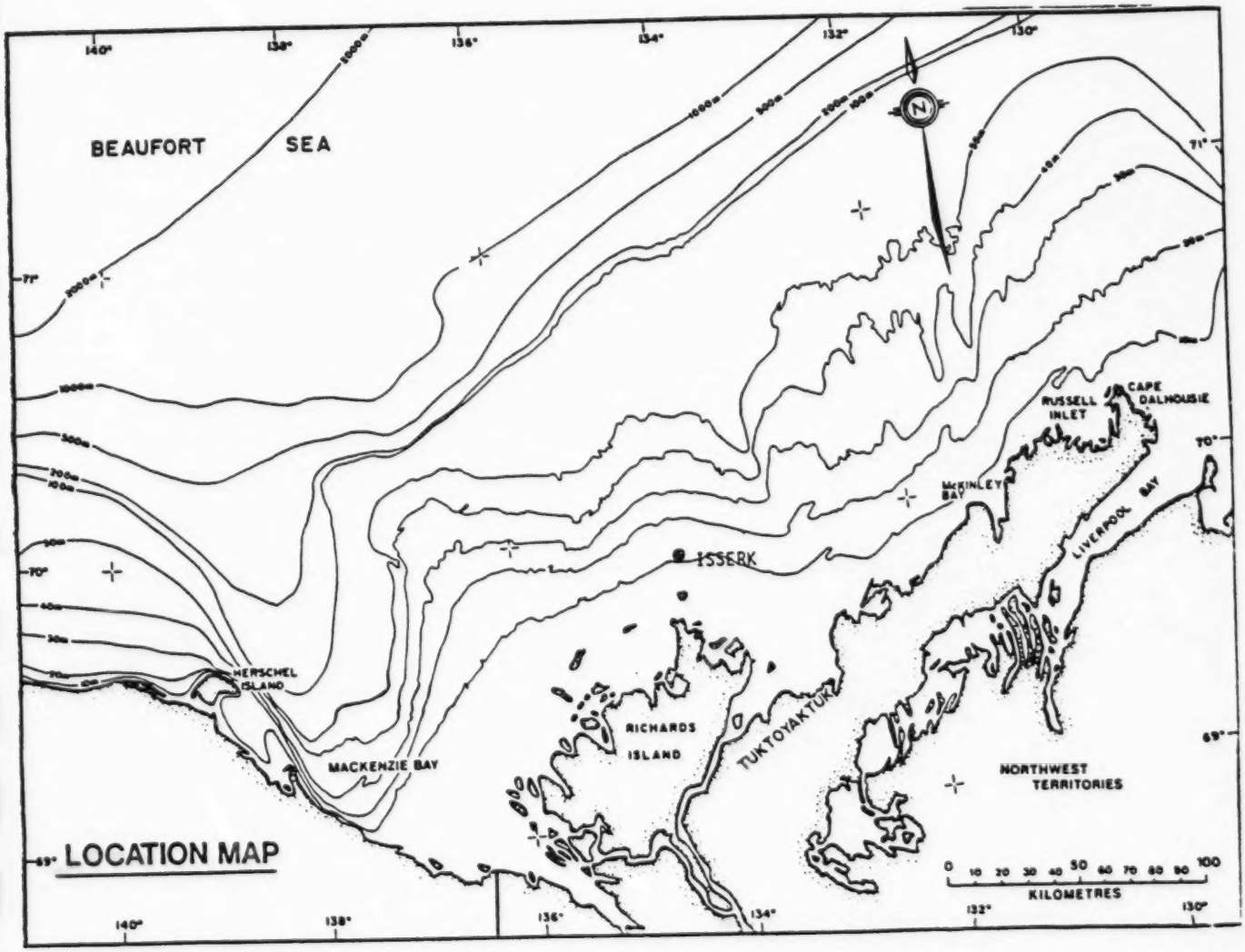
Inuvialuit Game Council

per: _____
A. Carpenter, Chairman

Esso Resources Canada Limited

per: _____
E. Bennett, Drilling Manager

APPENDIX K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MACKENZIE BAY
RICHARDS ISLAND
TUKTOYAKTUK
NORTHWEST TERRITORIES
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KILOMETRES
LOCATION MAP